Quality is more than a word

ESPEC

## Air to Air

# Thermal Shock Chambers

## TSA Series

CAT.NO.E11138-Z1111

# Energy savings and high reliability in the new series

New series thermal shock chambers have been developed to improve our existing models, in terms of reliability, but also in terms of efficiency.
Compared to the previous TSA series, the power consumption has been reduced of 35-50%.
Energy saving is achieved thanks to the Eco operation mode; the instrumentation automatically adjusts pre-cooling and pre-heating periods and runs operations with just the necessary energy.
Improvements in chamber's reliability. Particular emphasis was placed on removing unnecessary loads and stresses from the refrigeration system, refrigerators themselves,
and the refrigeration circuit.
Various measures have been implemented to anticipate troubles and enhance chamber's reliability.
Thermal stress on the specimen can differ according to its position; therefore we have further minimized variations in the temperature attainment time that influences test results. Finally, we are accurately responding to the needs of these days by adapting our safety designs to global requirements, thanks to our experience of the market.

TSA–72

TSA–102

TSA–202

TSA–302

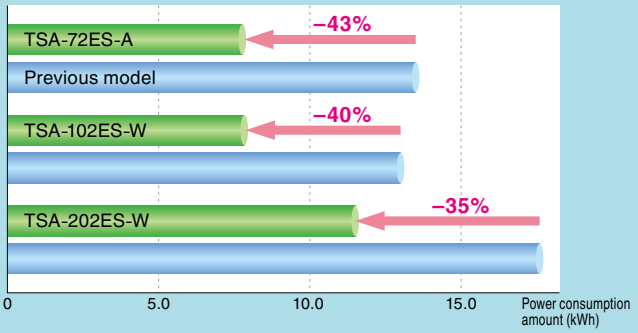
* Equipped with options.

# Characteristics

## Maximum 50% reduction in power consumption with Eco operation mode and new refrigerator control system

### Power consumption amount comparison example

(Power consumption amount per cycle by comparing ESPEC chambers)

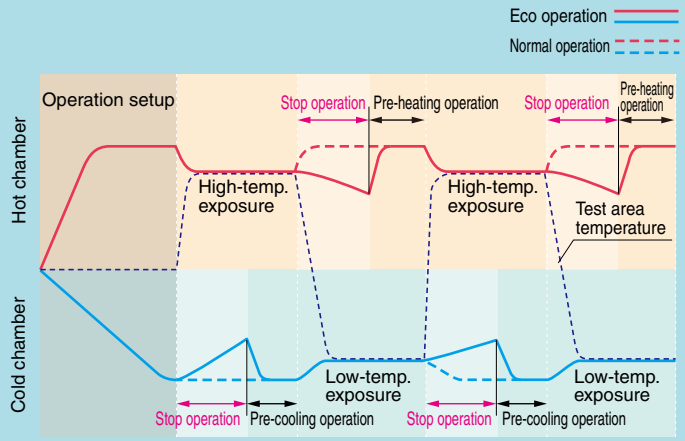



Test conditions (Two-zone)

High-temp. exposure : +125°C
Low-temp. exposure : −40°C
Specimen: Plastic molded ICs: 5 kg (72, 102)
10 kg (202)

Exposure time : 30 min.
Temperature recovery time : Within 5 min.

### Temperature changes under Eco operation (example)




### Automatic setting of pre-cooling and pre-heating in energy saving, Eco operation mode (Patent pending)

The new series incorporates an algorithm that calculates the minimum operation time for pre-cooling and pre-heating by constantly measuring the amount of heat required for these processes in eco operation mode. This feature can further reduce power consumption and remove the inaccuracies and hassles caused by adjustments based on preliminary experiments. Tests operation achieves both energy savings and reproducibility/ reliability.

### Parallel refrigerator control system for energy-saving control (Patent pending)

To optimize further the power consumption, the chamber features a parallel control system that connects two small refrigerators in parallel to the secondary side of the refrigeration circuit. The chamber can operate at the optimal refrigeration capacity based on the controlled temperature, by switching operation between two refrigerators simultaneously or a single refrigerator. At stable low-temperature exposures, power consumption is also reduced by limiting refrigeration capacity with an electronic expansion valve.

### Measuring used power (option: power meter)

A wattmeter is provided as an option to measure the power consumed. It is also possible to halt a test by setting the stop time. This function is useful for saving energy.

# Characteristics

## Further reductions in power consumption with 500-hour continuous tests

### Minimizing defrosting burden with defrost-free operation
**(option: defrost-free operation)**

Until now testing was interrupted for defrosting when necessary, but ESPEC has developed a unique structure that stops frost formation under low temperatures by preventing the penetration of outside air (defrost-free operation [patent 3514735]). Defrosting during cycle tests is then unnecessary, thus reducing defrosting time and the power consumed for this operation.

### 1000 cycles continuous operation
**(option: defrost-free operation)**

Defrost-free operation is provided as an option so 500-hour continuous operation can be performed without interruption (if test conditions are set for 15-minute exposure).

### Vertical sliding door

Equipped with a vertical sliding structure, the door does not disrupt when inserting and removing specimens or when connecting cables to a specimen. The door has been lightened so that it can be easily opened and closed.

### Equipped with a round cable port

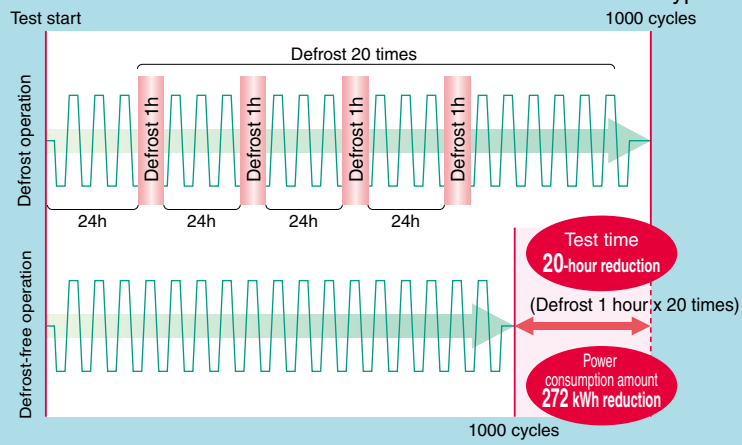
The chamber is equipped with a ø50 mm cable port so cables with bulky terminal connectors and plugs can be easily connected. A flat cable port is also available as an option.

### Combination with the ESPEC's evaluation system

The ESPEC's Conductor Resistance Evaluation System (sold separately) can continuously measure the minute resistance in solder joints and the conductive sections of connectors in low temperature and high temperature thermal cycle environments. It can be used connected to the thermal shock chamber.

### 1000 cycles (500-hour) test time comparison example

EH Type




**Consumed power amount to defrost once : 13.6 kWh**
**Consumed power amount to defrost (20 times) : 272 kWh**

Test conditions (Two-zone, No test halt)
High-temp. exposure : +150°C 15 min.
Low-temp. exposure : –65°C 15 min.
Outside conditions : +23°C/60% rh
Cooling water temp. : +25°C
Specimen : No specimen

Cable port ø50 mm

Vertically sliding door

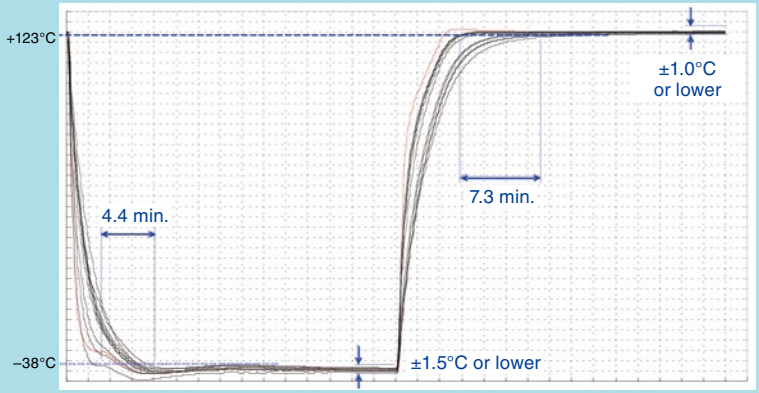
Conductor Resistance Evaluation System connection (example)

# Characteristics

## The pursuit of high performance, high accuracy, and ease of use.

### Recovery rate & temperature uniformity

TSA–202ES–W measurement example




Test conditions

High-temp. exposure: +125°C, 30 min.
Pre-heating temperature: +145°C
Low-temp. exposure: –40°C, 30 min.
Pre-cooling temperature:–55°C

Specimen: Printed circuit boards 150 pcs.
Measuring points: 10

Test area

### Highly accurate temperature recovery

Dampers with integrated rectifying function minimize variation in exposure conditions due to specimen position within the test area. This reduces the overall test time and shortens temperature recovery time, especially during low-temperature exposure. The uniformity in test conditions brought by this innovation also contributes to improved test reproducibility and reliability.

### Even more reliable tests

**(option: specimen temperature control*)**

A single temperature sensor is attached to the specimen in the test area and the chamber is controlled by this temperature measurement.
Even more accurate tests can be run by controlling the chamber with the specimen temperature because the air temperature and the temperature inside the specimen are different when attaining the temperature setting. The chamber is controlled so that the specimen temperature achieves the temperature setting even quicker and more accurately.

* Cannot be combined with Eco operation mode.

### Specimen temperature monitoring

**(option: specimen temperature monitor with trigger function)**

Two temperature sensors are attached to the specimen in the test area to measure the specimen's temperature.
This option features a trigger function that switches to the exposure test after the two temperatures reach the temperature setting, so even more precise thermal tests can be run.

* Cannot be combined with Eco operation mode.

# Characteristics

## Improved reliability. Use our chambers safely and with peace of mind for many years to come.

### The newly developed refrigeration system improves the refrigeration circuit reliability

To reduce thermal stress on the refrigerators and prevent corrosion in the circuit, the material and thickness of piping has been changed and this prevents refrigerant leaks. Through other countless detailed improvements, the reliability of the refrigeration circuit has been increased and it can be used safely for many years to come.

### Global safety design

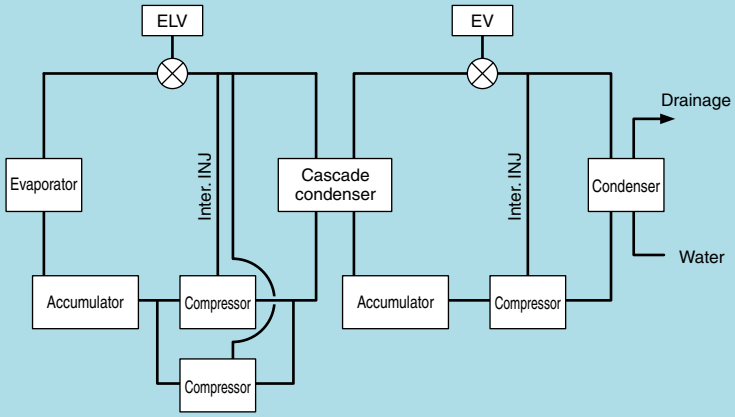
We deliver chambers that conform to international safety standards.
Our chambers conform to ISO risk assessment as well as global safety design electrical safety standards such as CE marking and EMC directive.

- ISO 12100: 2010
- ISO 60204-1
- IEC 610000-6

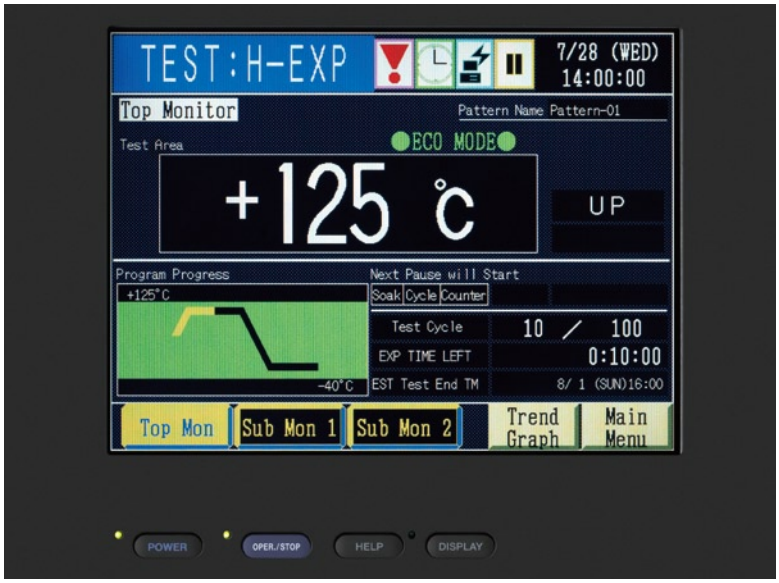
*EN standardization is standardized by the European Union

### Refrigeration circuit

(Parallel refrigeration system: patent pending)



# Instrumentation




## Color LCD interactive touch-screen system

Operation and settings simplified by the use of a touch-screen LCD display (instructions displayed on-screen). At-a-glance confirmation of test patterns, test area temperatures, temperature cycles, upstream / downstream control, and trend graphs display.

## Enhanced test halt preset function (Patent pending)

It is now possible to program tests to halt after cycle or exposure completion. Six cycle counters are also built-in to the instrumentation so a test halt preset can be programmed for each counter. The function can be used to multiple ends such as removing specimens to the chamber.

## Test continuity selection function

When the test is halted, select to resume the test from the point where it was halted or to start the test from the beginning.

### Test settings

### Test detail monitor

### Halt preset function

### Service guide

### Alarm

| | |
|---|---|
| Setting | Interactive key input by touch panel |
| Display | TFT Color LCD (10.4–inch) |
| Temperature control function | Test area: exposure temp.<br>Hot chamber: pre-heating temp.<br>Cold chamber: pre-cooling/defrosting temp. |
| | Temperature controls are PID control |
| Setting resolution | Temperature: 1°C<br>Time: 1 min.<br>(Remaining time display is 1 sec.) |
| Input | Thermocouple type T (copper/copper-nickel) |
| Setting range | Time: 0 to 99 hours 59 minutes<br>Test cycle: 1 to 9999 cycles |
| Test patterns | RAM (freely register): 40 patterns max. (Registration possible)<br>ROM (built-in fixed): 20 standard test patterns Registered |
| Auxiliary functions | • Timer preset<br>• Test continuity selection<br>• Overheat/overcool protection<br>• Up-stream/down-stream sensor selection<br>• Stable time control<br>• Exposure time reduction<br>• Eco operation<br>• Power failure recovery operation selection<br>• Automatic defrost<br>• Temperature recovery time setting<br>• Pre-conditioning/ posttreatment<br>• Dry operation<br>• Program memory<br>• Automatic power shut-off<br>• Programmed time display<br>• Cycle counter<br>• Test halt preset<br>• Completion mode selection<br>• Trend graph<br>• Alarm history display<br>• Sensor calibration<br>• RS–485 communication<br>• Accumulated time |

## TEST STANDARD AND COMPATIBLE MODELS

| Test standard | | Exposure temperature | | | Exposure time | | Temperature recovery time | Number of test cycles | Test starting point | Model*1 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | High temp. | Ambient temp. | Low temp. | High/low temp. | Ambient temp. | | | | EL type | ES type | EH type |
| MIL–STD–883H (Method No. 1010.8) | A | +85°C $^{+10}_{0}$ | — | –55°C $^{0}_{-10}$ | 10 min. or longer | — | Worst case specimen temp. Within 15 min. | Minimum 10 | Low temp. or High temp. | — | ○ | ○ |
| | B | +125°C $^{+15}_{0}$ | | | | | | | | — | ○ | ○ |
| | C | +150°C $^{+15}_{0}$ | | –65°C $^{0}_{-10}$ | | | | | | — | — | ○ |
| | D | +200°C $^{+15}_{0}$ | | | | | | | | — | — | — |
| | E | +300°C $^{+15}_{0}$ | | | | | | | | — | — | — |
| | F | +175°C $^{+15}_{0}$ | | | | | | | | — | — | ○ |
| MIL–STD–202G (Method No. 107G) | A | +85°C $^{+3}_{0}$ | +25°C $^{+10}_{-5}$ | –55°C $^{0}_{-3}$ | Differs according to specimen weight<br>28 g or lower, 15 min. or 30 min.<br>28 g to 136 g, 30 min.<br>136 g to 1.36 kg, 60 min.<br>1.36 to 13.6 kg, 120 min.<br>13.6 to 136 kg, 240 min. | Max 5 min. | Up–stream Within 5 min. | 5 cycles<br>25 cycles<br>50 cycles<br>100 cycles | Low temp. | ○*2 *3 | ○*2 | ○ |
| | B | +125°C $^{+3}_{0}$ | | –65°C $^{0}_{-5}$ | | | | | | — | ○*2 | ○ |
| | C | +200°C $^{+5}_{0}$ | | | | | | | | — | — | ○ |
| | D | +350°C $^{+5}_{0}$ | | | | | | | | — | — | — |
| | E | +500°C $^{+5}_{0}$ | | | | | | | | — | — | — |
| | F | +150°C $^{+3}_{0}$ | | | | | | | | — | ○*2 | ○ |
| IEC 60068–2–14 (JIS C 60068–2–14) | | +70°C ±2<br>+85°C ±2<br>+100°C ±2<br>+125°C ±2<br>+155°C ±2<br>+175°C ±2<br>+200°C ±2 | — | –5°C ±3<br>–10°C ±3<br>–25°C ±3<br>–40°C ±3<br>–55°C ±3<br>–65°C ±3 | 3 hrs.<br>2 hrs.<br>1 hrs.<br>If not specified: 3 hrs. | — | Exposure time within 10% | If not specified 5 cycles | Low temp. | ○*2 | ○*2 | ○ |
| JASO D 014–4 | | +65°C ±2<br>+70°C ±2<br>+80°C ±2<br>+85°C ±2<br>+90°C ±2<br>+100°C ±2<br>+110°C ±2<br>+120°C ±2<br>+125°C ±2<br>+130°C ±2<br>+140°C ±2<br>+150°C ±2<br>+155°C ±2<br>+160°C ±2 | — | –20°C ±3<br>–40°C ±3 | 20 min.<br>40 min.<br>60 min.<br>90 min. | — | Exposure time within 10% | If not specified 5 cycles | Low temp. | ○*2 | ○*2 | ○ |
| EIAJ ED-2531A | | +60°C ±2<br>+65°C ±2<br>+70°C ±2<br>+75°C ±2<br>+80°C ±2<br>+85°C ±2<br>+90°C ±2<br>+95°C ±2<br>+100°C ±2 | Ambient temp. | 0°C ±3<br>-5°C ±3<br>-10°C ±3<br>-15°C ±3<br>-20°C ±3<br>-25°C ±3<br>-30°C ±3<br>-35°C ±3<br>-40°C ±3<br>-45°C ±3<br>-50°C ±3 | 3 hrs.<br>2 hrs.<br>1 hrs.<br>If not specified: 3 hrs. | 2 to 3 min. | Exposure time within 10% | 5 or 10 cycles | Low temp. | ○*2 *3 | ○ | ○ |

*1 The test results may not meet specifications depending on the quantity of specimens or the setting method.
*2 Some models cannot be used depending on test conditions. For further information, please contact ESPEC.
*3 Applicable when equipped with the ambient-temperature exposure option.

## CHAMBER AND UTILITY REQUIREMENTS

| Model | | EL type | | | | | ES type | | | | EH type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 42EL–A | 72EL–A | 102EL–A | 202EL–W | 302EL–W | 72ES–A | 72ES–W | 102ES–W | 202ES–W | 72EH–W |
| | | Air-cooled | | | Water-cooled | | Air-cooled | Water-cooled | | | Water-cooled |
| Power supply | 200 VAC | 49 A | 70 A | 70 A | 110 A | 120 A | 78 A | | | 120 A | 112 A |
| | 220 VAC | 47 A | 70 A | 70 A | 110 A | 120 A | 75 A | | | 120 A | 108 A |
| | 380/400/415 VAC | 27 A | 45 A | 45 A | 65 A | 70 A | 50 A | | | 70 A | 60 A |
| Air | | 0.4 to 0.7 MPa (4 to 7 kgf/cm²) | | | | | | | | | |
| Condensation load (KJ/h)*1 | 50 Hz | — | | | 95700 | | — | 59700 | | 95700 | 95700 |
| | 60 Hz | — | | | 96100 | | — | 64800 | | 104600 | 96100 |
| Cooling water supply rate (at reference water temp.+32°C)*1*2 | | — | | | 4.6 m³/h | | — | 3.1 m³/h | | 4.6 m³/h | |
| Water pressure | | — | | | 0.2 to 0.5 MPa (2 to 5 kgf/cm²) | | — | 0.2 to 0.5 MPa (2 to 5 kgf/cm²) | | | |
| Piping connection size | | 32 A | | | | | | | | | |
| Outside dimensions mm (inch) | | W 1140 H 1900 D 1270 | W 1310 H 1900 D 1470 | W 1550 H 1900 D 1470 | W 1550 H 1900 D 1770 | W 1870 H 1900 D 1770 | W 1310 H 1900 D 1470 | | W 1550 H 1900 D 1470 | W 1550 H 1900 D 1770 | W 1310 H 1900 D 1770 |

*1 Maximum possible value during temperature recovery.
*2 Rate depends on the cleanliness of the heat exchanger.

# EL Type

| Model | | | TSA–42EL–A | TSA–72EL–A | TSA–102EL–A | TSA–202EL–W | TSA–302EL–W |
|---|---|---|---|---|---|---|---|
| System | | | Two-zone test by means of damper switching | | | | |
| Performance*1 | Test area | High temp. exposure range*2 | Ambient temp. +50 to +200°C (+122 to +392°F) | | | | |
| | | Low temp. exposure range | –65 to 0°C (–85 to +32°F) | | | | |
| | | Temp. fluctuation*3 | ±0.5°C (±0.9°F) | | | | |
| | Hot chamber | Pre-heat upper limit | +205°C (+401°F) | | | | |
| | | Temp. heat up time*4 | Within 10 min. | Ambient temp. to +200°C (+392°F) Within 15 min. | | | |
| | Cold chamber | Pre-cool lower limit | –75°C (–103°F) | | | | |
| | | Temp. pull down time*4 | Within 70 min. | Within 40 min. | Within 60 min. | Within 70 min. | Within 40 min. |
| | Temp. recovery | Recovery conditions | Two-zone: High temp. exposure: +125°C 30 min. Low temp. exposure: –40°C 30 min. Power supply voltage: Rated voltage Sensor position: Upstream | | | | |
| | | | Specimen 3.5 kg (Plastic molded ICs, 2.5 kg, specimen basket/brackets 1 kg) | Specimen 6.5 kg (Plastic molded ICs, 5 kg, specimen basket/brackets 1.5 kg) | Specimen 7.5 kg (Plastic molded ICs, 5 kg, specimen basket/brackets 2.5 kg) | Specimen 16 kg (Plastic molded ICs, 10 kg, specimen basket/brackets 6 kg) | Specimen 17 kg (Plastic molded ICs, 10 kg, specimen basket/brackets 7 kg) |
| | | Temp. recovery time*5 | Within 15 min. | Within 5 min. | | | Within 10 min. |
| Construction | Exterior material | | Cold-rolled rust proof treated steel plate (melamine resin coating) | | | | |
| | Interior material | | Stainless steel plate | | | | |
| | Insulation | | Glass wool, rigid polyurethane foam | | | | |
| | Door | | Manually operated sliding door with unlock button | | | | |
| | Heater | | Stripped wire heater | | | | |
| | Refrigeration unit | System | Mechanical cascade refrigeration system | | | | |
| | | | Air-cooled condenser | | | Water-cooled condenser | |
| | | Compressor | Hermetically sealed rotary compressor | Hermetically sealed scroll compressor | | | |
| | | Expansion mechanism | Electronic expansion valve, other | | | | |
| | | Refrigerant | High temp. side: R404A Low temp. side: R508A | High temp. side: R404A Low temp. side: R23 | | | |
| | Cooler | | Plate fin cooler, cold accumulator | | | | |
| | Air circulator | | Sirocco fan | | | | |
| | Damper driving unit | | Air cylinder | | | | |
| Test area load resistance | | | 30 kg (Equally distributed load) | | 50 kg (Equally distributed load) | | |
| Inside dimensions (W x H x D mm/in.) | | | 240 x 460 x 370 (9.45 x 18.11 x 14.57) | 410 x 460 x 370 (16.14 x 18.11 x 14.57) | 650 x 460 x 370 (25.59 x 18.11 x 14.57) | 650 x 460 x 670 (25.59 x 18.11 x 26.38) | 970 x 460 x 670 (38.19 x 18.11 x 26.38) |
| Outside dimensions (W x H x D mm/in.)*6 | | | 1140 x 1900 x 1270 (44.88 x 74.80 x 50) | 1310 x 1900 x 1470 (51.57 x 74.80 x 57.87) | 1550 x 1900 x 1470 (61.02 x 74.80 x 57.87) | 1550 x 1900 x 1770 (61.02 x 74.80 x 69.69) | 1870 x 1900 x 1770 (73.62 x 74.80 x 69.69) |
| Weight | | | Approx. 730 kg | Approx. 900 kg | Approx. 1050 kg | Approx. 1200 kg | Approx. 1420 kg |
| Utility requirements | Allowable ambient conditions | | 0 to 40°C (+32 to +104°F) | | | | |
| | Power supply | 200 VAC 3ø 50/60 Hz | 49 A | 70 A | 70 A | 110 A | 120 A |
| | | 220 VAC 3ø 60 Hz | 47 A | 70 A | 70 A | 110 A | 120 A |
| | | 380/400/415 VAC 3ø 50 Hz | 27 A | 45 A | 45 A | 65 A | 70 A |
| | Noise level*7 | | 65 dB | | | 62 dB | 65 dB |
| | Air supply | | 0.4 to 0.7 MPa (4 to 7 kgf/cm²) | | | | |
| | Cooling water supply pressure | | — | | | 0.2 to 0.5 MPa (2 to 5 kgf/cm²) | |
| | Cooling water supply rate*8 | | — | | | 4.6 m³/h (ref. water temp.: +32°C) | |
| | Operating cooling water temp. range | | — | | | +5 to +38°C (+41 to +100°F) | |

*1 Air-cooled: Ambient temperature of +23°C
Water-cooled: Ambient temperature of +10 to +30°C and a cooling water temperature of +25°C
*2 If the high-temperature exposure range lower limit +60°C is required, select the "ambient-temperature exposure" option
*3 Performance shown above conforms to IEC 60068-3-5: 2001
*4 Temperature heat-up/pull-down time are applicable only during independent chamber operation
*5 Tolerance in temperature recovery time is based on IEC60068-2-1 and IEC60068-2-2
*6 Excluding protrusions
*7 Noise level was measured in an anechoic room at a height of 1.2 m from the floor and a distance of 1 m from the chamber front panel (ISO 1996-1:2003 A-weighted sound pressure level). Actual noise emissions may increase because of surrounding reverberations in the place of installation, therefore use caution in selecting a place of use.
*8 Rate depends on the cleanliness of the heat exchanger

# ES Type

| Model | | | TSA–72ES–A/W | TSA–102ES–W | TSA–202ES–W |
|---|---|---|---|---|---|
| System | | | Two-zone or three-zone test by means of damper switching | | |
| Performance*1 | Test area | High temp. exposure range | +60 to +200°C (+140 to +392°F) | | |
| | | Low temp. exposure range | –70 to 0°C (–94 to +32°F) | | |
| | | Temp. fluctuation*2 | ±0.5°C (±0.9°F) | | |
| | Hot chamber | Pre-heat upper limit | +205°C (+401°F) | | |
| | | Temp. heat up time*3 | Ambient temp. to +200°C (+392°F) within 15 min. | | |
| | Cold chamber | Pre-cool lower limit | –75°C (–103°F) | | |
| | | Temp. pull down time*3 | Ambient temp. to –75°C (–103°F) | | |
| | | | Within 40 min. | Within 50 min. | Within 45 min. |
| | Temp. recovery | Recovery conditions | · Three-zone<br>High-temp. exposure: +150°C, 30 min.<br>Ambient-temperature exposure: Ambient temperature, 5 min.<br>Low-temp. exposure: –65°C, 30 min.<br>· Power supply voltage: Rated voltage<br>· Sensor position: Upstream | | · Three-zone<br>High-temp. exposure: +150°C, 30 min.<br>Ambient-temperature exposure: Ambient temperature, 10 min.<br>Low-temp. exposure: –65°C, 30 min.<br>· Power supply voltage: Rated voltage<br>· Sensor position: Upstream |
| | | | · Specimen 6.5 kg<br>Plastic molded ICs: 5 kg<br>Specimen basket/brackets: 1.5 kg | · Specimen 7.5 kg<br>Plastic molded ICs: 5 kg<br>Specimen basket/brackets: 2.5 kg | · Specimen 26 kg<br>Plastic molded ICs: 20 kg<br>Specimen basket/brackets: 6 kg |
| | | Temp. recovery time*4 | Within 5 min. | | Within 10 min. |
| Construction | Exterior material | | Cold rolled rust proof treated steel plate (melamine resin coating) | | |
| | Interior material | | Stainless steel plate | | |
| | Insulation | | Glass wool/rigid polyurethane foam | | |
| | Door | | Manually operated sliding door with unlock button | | |
| | Heater | | Stripped wire heater | | |
| | Refrigeration unit | System | Mechanical cascade refrigeration system | | |
| | | | Air-cooled condenser or water-cooled condenser | Water-cooled condenser | |
| | | Compressor | Hermetically sealed scroll compressor | | |
| | | Expansion mechanism | Electronic expansion valve, other | | |
| | | Refrigerant | High temp. side: R404A Low temp. side: R23 | | |
| | Cooler | | Plate fin cooler, cold accumulator | | |
| | Air circulator | | Sirocco fan | | |
| | Damper driving unit | | Air cylinder | | |
| Test area load resistance | | | 30 kg (Equally distributed load) | 50 kg (Equally distributed load) | |
| Inside dimensions (W x H x D mm/in.) | | | 410 x 460 x 370 (16.14 x 18.11 x 14.57) | 650 x 460 x 370 (25.59 x 18.11 x 14.57) | 650 x 460 x 670 (25.59 x 18.11 x 26.38) |
| Outside dimensions (W x H x D mm/in.)*5 | | | 1310 x 1900 x 1470 (51.57 x 74.80 x 57.87) | 1550 x 1900 x 1470 (61.02 x 74.80 x 57.87) | 1550 x 1900 x 1770 (61.02 x 74.80 x 69.69) |
| Weight | | | Approx. 1050 kg | Approx. 1150 kg | Approx. 1400 kg |
| Utility requirements | Allowable ambient conditions | | 0 to +40°C (+32 to +104°F) | | |
| | Power supply | 200 VAC 3ø 50/60 Hz | 78 A | | 120 A |
| | | 220 VAC 3ø 60 Hz | 75 A | | 120 A |
| | | 380/400/415 VAC 3ø 50 Hz | 50 A | | 70 A |
| | Noise level*6 | | 65 dB or lower | | |
| | Air supply | | 0.4 to 0.7 MPa (4 to 7 kgf/cm²) | | |
| | Cooling water supply pressure | | 0.2 to 0.5 MPa (2 to 5 kgf/cm²) (water-cooled specification) | | 0.2 to 0.5 MPa (2 to 5 kgf/cm²) |
| | Cooling water supply rate*7 | | 3.1 m³/h (reference water temp: +32°C) (water-cooled specification) | | 4.6 m³/h (reference water temp: +32°C) |
| | Operating cooling water temp. range | | +5 to +38°C (water-cooled specification) | | |

*1 Ambient temperature of +23°C and a cooling water temperature of +25°C
*2 Performance shown above conforms to IEC 60068-3-5: 2001
*3 Temperature heat-up/pull-down time are applicable only during independent chamber operation
*4 Tolerance in temperature recovery time based on IEC60068-2-1 and IEC60068-2-2
*5 Excluding protrusions
*6 Noise level was measured in an anechoic room at a height of 1.2 m from the floor and a distance of 1 m from the chamber front panel (ISO 1996-1:2003 A-weighted sound pressure level). Actual noise emissions may increase because of surrounding reverberations in the place of installation, therefore use caution in selecting a place of use.
*7 Rate depends on the cleanliness of the heat exchanger

# EH Type

| Model | | | TSA–72EH–W |
|---|---|---|---|
| System | | | Two-zone or three-zone test by means of damper switching |
| Performance*1 | Test area | High temp. exposure range*2 | +60 to +200°C (+140 to +392°F) |
| | | Low temp. exposure range | –70 to 0°C (–94 to +32°F) |
| | | Temp. fluctuation*3 | ±0.5°C (±0.9°F) |
| | Hot chamber | Pre-heat upper limit | +205°C (+401°F) |
| | | Temp. heat up time*4 | Ambient temp. to +200°C (+392°F) within 15 min. |
| | Cold chamber | Pre-cool lower limit | –77°C (–106.6°F) |
| | | Temp. pull down time*4 | Ambient temp. to –75°C (–103°F) within 50 min. |
| | Temp. recovery | Recovery conditions | · Two-zone<br>High-temp. exposure: +150°C, 15 min.<br>Low-temp. exposure: –65°C, 15 min.<br>· Power supply voltage: Rated voltage<br>· Sensor position: Downstream<br>· Specimen 5 kg<br>Plastic molded ICs: 3.5 kg<br>Specimen basket/brackets: 1.5 kg |
| | | Temp. recovery time*5 | Within 5 min. |
| Construction | Exterior material | | Cold rolled rust proof treated steel plate (melamine resin coating) |
| | Interior material | | Stainless steel plate |
| | Insulation | | Glass wool/rigid polyurethane foam |
| | Door | | Manually operated sliding door with unlock button |
| | Heater | | Stripped wire heater |
| | Refrigeration unit | System | Mechanical cascade refrigeration system<br>Water-cooled condenser |
| | | Compressor | Hermetically sealed scroll compressor |
| | | Expansion mechanism | Electronic expansion valve, other |
| | | Refrigerant | High temp. side: R404A Low temp. side: R23 |
| | Cooler | | Plate fin cooler, cold accumulator |
| | Air circulator | | Sirocco fan |
| | Damper driving unit | | Air cylinder |
| Test area load resistance | | | 30 kg (Equally distributed load) |
| Inside dimensions (W x H x D mm/in.) | | | 410 x 460 x 370 (16.14 x 18.11 x 14.57) |
| Outside dimensions (W x H x D mm/in.)*6 | | | 1310 x 1900 x 1770 (51.57 x 74.80 x 69.68) |
| Weight | | | Approx. 1150 kg |
| Utility requirements | Allowable ambient conditions | | 0 to +40°C (+32 to +104°F) |
| | Power supply | 200 VAC 3ø 50/60 Hz | 112 A |
| | | 220 VAC 3ø 60 Hz | 108 A |
| | | 380/400/415 VAC 3ø 50 Hz | 60 A |
| | Noise level*7 | | 65 dB or lower |
| | Air supply | | 0.4 to 0.7 MPa (4 to 7 kgf/cm²) |
| | Cooling water supply pressure | | 0.2 to 0.5 MPa (2 to 5 kgf/cm²) |
| | Cooling water supply rate*8 | | 4.6 m³/h (reference water temp: +32°C) |
| | Operating cooling water temp. range | | +5 to +38°C |

*1 Ambient temperature of +23°C and a cooling water temperature of +25°C
*2 During pre-heating, prevention operation for temperature heat-up may be worked.
*3 Performance shown above conforms to IEC 60068-3-5: 2001
*4 Temperature heat-up/pull-down time are applicable only during independent chamber operation
*5 Tolerance in temperature recovery time based on IEC60068-2-1 and IEC60068-2-2
*6 Excluding protrusions
*7 Noise level was measured in an anechoic room at a height of 1.2 m from the floor and a distance of 1 m from the chamber front panel (ISO 1996-1:2003 A-weighted sound pressure level). Actual noise emissions may increase because of surrounding reverberations in the place of installation, therefore use caution in selecting a place of use.
*8 Rate depends on the cleanliness of the heat exchanger

## SAFETY DEVICES

- Leakage breaker (200, 220V AC specifications)
- Circuit breaker (380, 400/415V AC CE specifications)
- Electrical compartment door switch
- Test area door switch
- Hot chamber overheat protection switch
- Cold chamber overheat protection switch
- Hot chamber overheat protector (controller)
- Cold chamber overheat protector (controller)
- Air circulator overload relay
- Refrigerator high/low pressure switches
- Compressor built-in protector (except TSA–42EL)
- Compressor temperature switch
- Thermal relay for compressor (TSA–42EL only)
- Water suspension relay (water-cooled specification only)
- Air circulator thermal relay
- Motor reverse prevention relay
- Air pressure switch
- Fuse
- Cooling tower interlock terminal (water-cooled specification only)
- Compressor circuit breaker
- Heater circuit breaker
- Test area overheat/overcool protector (controller)
- Test area overheat/overcool protector (option)
- Air purge valve
- Specimen power supply control terminal

## FITTINGS

- Cable port ø50 mm (left side) ..... 1
- Specimen power supply control terminal ..... 1
- Time signals ..... 2

DANGER

- Do not use explosive substances, flammable substances, or substances that contain those substances as a specimen under any circumstances. Danger: Risk of explosion and fire.
- Do not put corrosive substances inside the test area. If corrosive substances are generated from the specimen, the life of the product's corrosion resistance will decrease dramatically due, in particular, to corrosion of stainless steel, resin, and silicone.
- Do not use living organisms or items that exceed the allowable heat load as a specimen.

CAUTION

Always read the user's manual before using the product.

## MODEL

TSA – □□ □

- □ Condensation system
  - A : Air-cooled type
  - W : Water-cooled type
- □□ Performance classification
  - EL
  - ES
  - EH
- □ Test area capacity
  - 42 : 40L
  - 72 : 70L
  - 102 : 110L
  - 202 : 200L
  - 302 : 300L

## ACCESSORIES

- Specimen basket (18-8 Cr-Ni stainless steel/5 mesh metal basket)

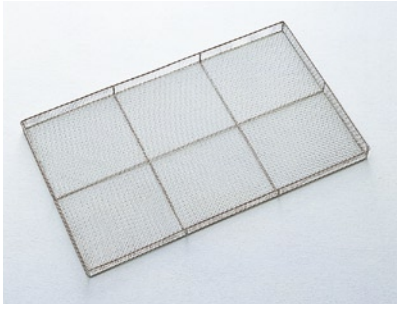
  TSA-42
  (W230 x H40 x D356 mm/load capacity 2.5 kg) ..... 2

  TSA-72
  (W400 x H40 x D356 mm/load capacity 5 kg) ..... 2

  TSA-102
  (W640 x H40 x D356 mm/load capacity 5 kg) ..... 2

  TSA-202
  (W640 x H40 x D656 mm/load capacity 17 kg) ..... 2

  TSA-302
  (W960 x H40 x D656 mm/load capacity 17 kg) ..... 2

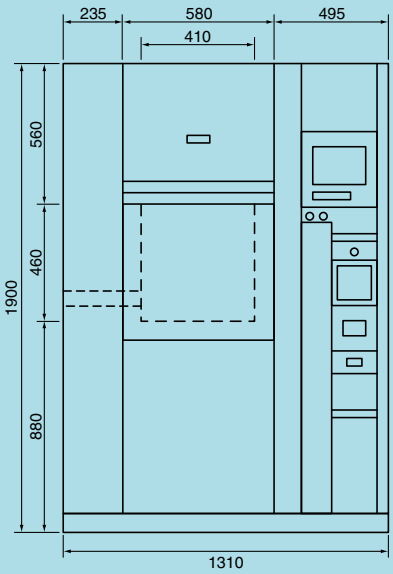


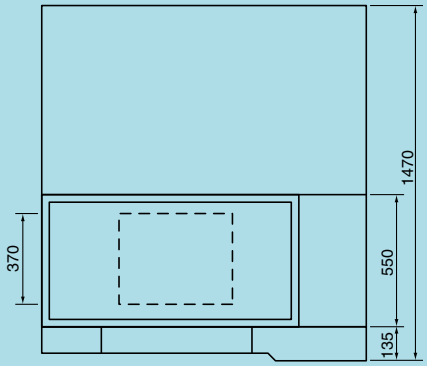
- Shelf brackets
  (shelf attachment pitch 60 mm, adjustable in 7 levels) .... 2 sets
- Cartridge fuse
  - 5A ..... 2
  - 10A (non-standard specification) ..... 1
- Cable port rubber plug ..... 1
- Nipple (water-cooled specification only) ..... 1
- Strainer (water-cooled specification only) ..... 1
- Strainer element (water-cooled specification only) ..... 1
- User's manual ..... 1

## DIMENSIONS

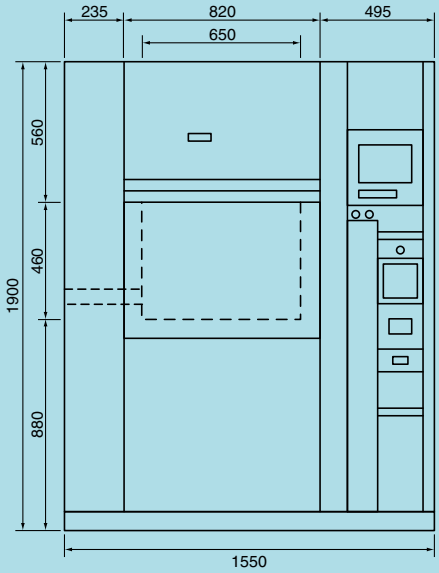
(Unit: mm)

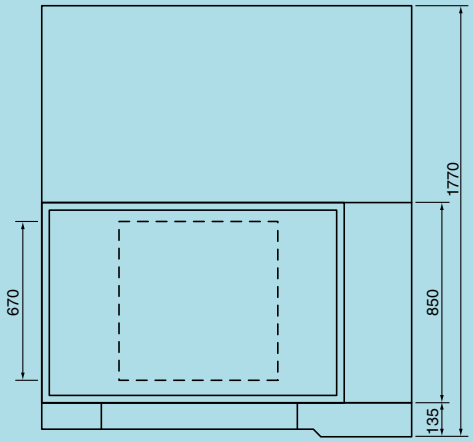
### TSA–72EL · 72ES




### TSA–202EL · 202ES



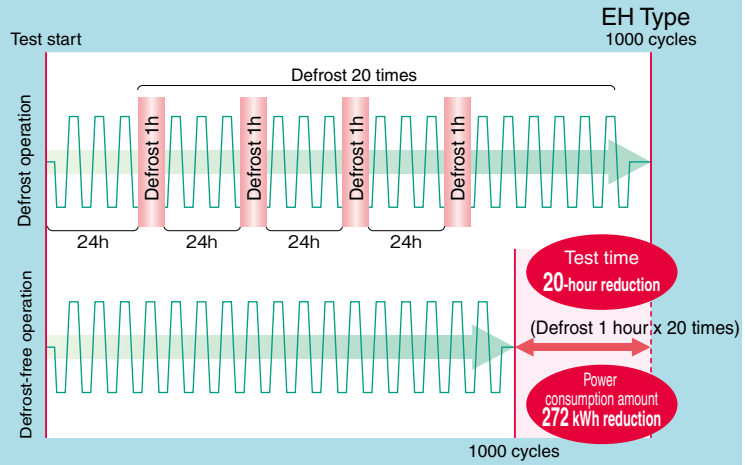
## OPTIONS

### Defrost-free operation

For two-zone tests, enables continuous tests without requiring defrosting for up to 500 hours max.
ESPEC has developed a unique structure (patent: 3514735) that prevents the penetration of outside air and uses recirculated air during testing to stop frosting on the low-temperature side.
This enables continuous tests up to 500 hours, so around 20 defrost cycles during this period can be eliminated.
This option can reduce both the test time in the amount of the defrosting time (approx. 60 minutes each time) and the power consumption required for defrosting (13.6 kWh each time).

* The TSA–42EL–A, 72EL–A and 102EL–A have a 300-mm protrusion on the top.

**● 1000 cycles (500-hour) test time comparison example**




**Power consumed amount to defrost once : 13.6 kWh**
**Power consumed amount to defrost (20 times) : 272 kWh**

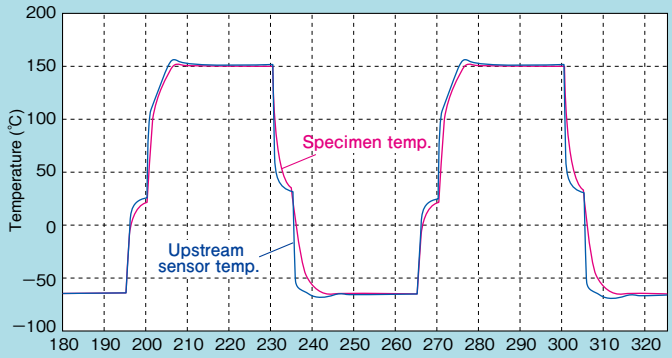
Test conditions (Two-zone, No test halt)
High-temp. exposure : +150°C 15 min.
Low-temp. exposure : –65°C 15 min.
Outside conditions : +23°C/60% rh
Cooling water temp. : +25°C
Specimen : No specimen

| Model | TSA-42EL | TSA-72EL, ES | TSA-102EL, ES | TSA-202EL, ES | TSA-302EL | TSA-72EH |
|---|---|---|---|---|---|---|
| Number of cycles | Maximum 500 cycles (Maximum 500-hour) | | | | | Maximum 1000 cycles (Maximum 500-hour) |
| High-temp. exposure/ time | +125°C/30 min. | | | | | +150°C/ 15 min. |
| Low-temp. exposure/ time | –40°C/30 min. | | | | | –65°C/ 15 min. |
| Outside conditions | +23°C/60% rh | | | | | |
| Cooling water temp. | +25°C | | | | | |
| Power supply voltage | Rated voltage | | | | | |
| Sensor position | Downstream of specimen | | | | | |
| Specimen | 1.5 kg (Plastic molded ICs 1.0 kg Specimen basket/shelf brackets 0.5 kg) | 5.0 kg (Plastic molded ICs 3.5 kg Specimen basket/ shelf brackets 1.5 kg) | | 10.0 kg (Plastic molded ICs 7 kg Specimen basket/ shelf brackets 3 kg) | | 5.0 kg (Plastic molded ICs 3.5 kg Specimen basket/shelf brackets 1.5 kg) |
| Temp. recovery time | Within 15 min. | Within 5 min. | | | Within 10 min. | Within 5 min. |

# OPTIONS

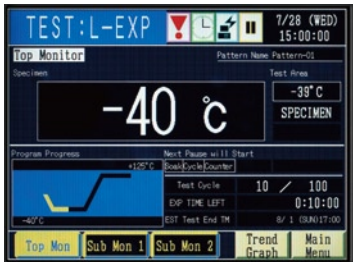
## Specimen temperature control

### Measurement example TSA-72ES-A




Test conditions

| | | | | |
|---|---|---|---|---|
| High temp. exposure | +150°C | 30 min. | Specimen | Plastic molded ICs (3.5 kg) |
| Ambient temp. exposure | | 5 min. | Specimen baskets | 2nd and 6th level from top |
| Low temp. exposure | −65°C | 30 min. | Control points | 28-pin QFP (quad flat package) with sensor installed at center of 6th level |



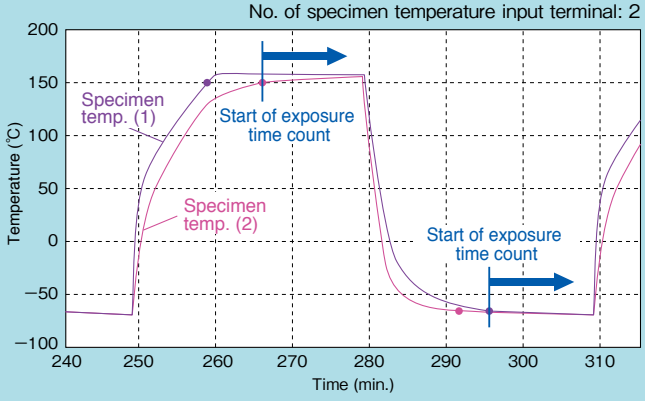
A sensor is attached to the specimen to control the chamber based on the specimen temperature. The specimen temperature reaches and maintains the temperature setting as fast and accurately as possible.
(Cannot be combined with Eco operation mode.)

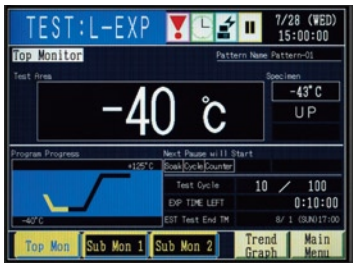
- Number of measuring points: 1
- Location: Chamber front, left-side panel
- Accessory: Thermocouple type T (copper, copper-nickel) x1*

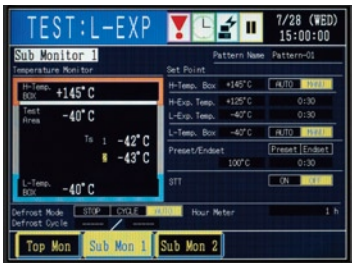
* 2 when simultaneously equipped with a recorder

## Specimen temperature monitoring with trigger function

### Measurement example




Two sensors are attached to the specimen and the temperature of the specimen displayed on the instrumentation is monitored. The option has a trigger function that switches to the exposure test after the specimen temperatures reach the temperature setting, so even more precise tests can be run. It can also record the temperatures of the specimen and the test area when connected to a temperature recorder.
(Cannot be combined with Eco operation mode.)

- Number of measuring points: 2
- Location: Chamber front, left-side panel
- Accessory: Thermocouple type T (copper, copper-nickel) x2*

* 4 when simultaneously equipped with a recorder

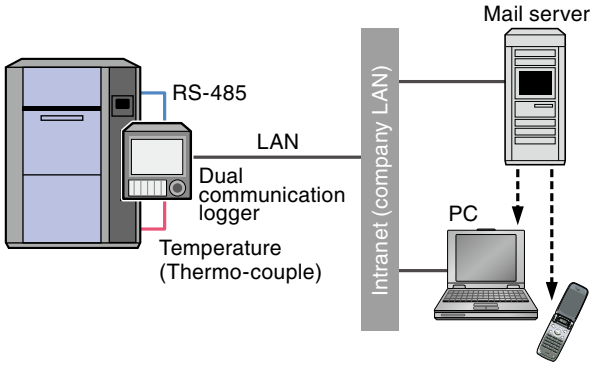
# OPTIONS

## Dual communication logger

Connect to a company network and the chamber status can be monitored on PCs and data can also be managed.
Chamber failures information can be sent to PCs and cellular telephones via emails.

Number of connected units
- 1 unit

Functions
- Monitoring function
- Data management function
- Communication function




| Model | | TMS |
|---|---|---|
| Monitoring function | Monitor details | · Operation state<br>· Exposure state<br>· Running cycle<br>· Setting cycle<br>· Test area temperature (Hot chamber, cold chamber, specimen temp.)<br>· Test area display temperature<br>· Remaining step time<br>· Number of alarms<br>· Alarm number 1, 2<br>· Trend graph |
| | Analog input | Thermocouple, measured temperature resistance, voltage, contact, other temperature/humidity input |
| | Monitor screen | Monitoring one chamber on one browser screen |
| Data management functions | Save data | Save data as binary data on a CF card in the chamber |
| | Save interval | From 1 sec. (display update interval asnd auto save interval) |
| | File creation interval | · Auto save interval<br>· Memory time up (select from hour, day, week, month) |
| | Display saved data | Trend display, digital display with dedicated software, convert to Excel data, etc. |
| | Download data | Download saved data via the network |
| Error notification | | · Send by email<br>· Change the logger display color |

# OPTIONS

## Ambient-temperature exposure (EL type only)

Enables three-zone tests by adding a damper mechanism and an air circulator.
· High temp. exposure range: +60 to 200°C

## Recorder terminal

Used to output the temperature within test area, hot chamber, and cold chamber.

## Thermocouple

Attached to specimens to measure specimen temperature.
· 2, 4, 6m
· Thermocouple type T (Copper, copper-nickel)

## Exposure signal output

A signal is output via a contact switch when test area temperature is within the user-selected range. This signal can be used to control peripheral instruments, like applying a voltage to specimens only during high temperature exposure, or monitoring test operation from a remote point. Preparation of a power cable, temperature sensor, and conductor grounding wire for additional installation in the future.

## Power meter

Accumulates the amount of power the chamber uses.

## Paperless recorder

Records the temperature of each section such as the temperature inside the chamber.
PL1S: Number of inputs: 1 (5 OFF*)
Scan interval: 1 sec.
PL3S: Number of inputs: 3 (3 OFF*)
Scan interval: 1 sec.
PL3L: Number of inputs: 3 (3 OFF*)
Scan interval: 5 sec.
PL4S: Number of inputs: 4 (2 OFF*)
Scan interval: 1 sec.
PL4L: Number of inputs: 4 (2 OFF*)
Scan interval: 5 sec.
PL5S: Number of inputs: 5 (1 OFF*)
Scan interval: 1 sec.
PL5L: Number of inputs: 5 (1 OFF*)
Scan interval: 5 sec.
· Temperature range: –100 to +220°C
· External memory
CF memory card port
(Includes a 256 MB CF card)
USB memory port
· Languages: English/Japanese, can be changed
* Channels can be turned ON

## Temperature recorder (digital display)

RK–61 1 pen
RK–63 3 pens
RK–64 6 dots
· Temperature range: –100 to +220°C
· Effective recording chart width 100 mm

## Recorder wiring

Preparation of a power cable, temperature sensor, and conductor grounding wire for additional installation in the future.

## Additional overheat protectors

Additional preventive measures can be taken for excessive temperature rise in the chamber, in addition to the standard equipped overheat protector.

## External alarm terminal

If the safety device of the chamber is activated, the external alarm terminal will notify it to a remote point.

## Emergency stop pushbutton

Stops the chamber immediately.

## Status indicator light

To check the state of the chamber from distant locations.

## Total cycle counter

Indicates cycle counts.
· With reset function
· Display range: 1 to 99999999

## Built-in air compressor

Select when there is no air supply source.

# OPTIONS

## Automatic door

Automatic sliding door (vertical) operated by single-touch button. Equipped with 2 safety mechanisms: a photoelectric sensor, and a touch sensor. A door stop switch is also set.

* If you also need the emergency stop switch, please contact us.

## Additional cable port

Provided in addition / replacement of the standard cable port (left side)

· φ50 mm round

## Flat cable port

Provided in addition / replacement of the standard cable port (left side).

· 25 x 100 mm slot

## Cable port rubber plug

Prevents air leakage from the cable port.

· φ50 mm for round port

· For flat cables

## Caster

Installed for mobility.

· 6 casters (4 for TSA–42EL)

· 4 levelling feet

## Specimen basket/shelf brackets

Equivalent to standard accessory.

· Material: stainless steel (5 mesh)

## Heavy-duty shelf

Use to hold heavy specimens exceeding the load capacity of the standard specimen basket.

· Load capacity: 30 kg

## Chamber dew tray

Prevents water leaks from the chamber onto the floor.

* The use of casters is recommended to facilitate operation.

## Anchoring fixtures

Used to bolt the chamber to the floor.

## Interface

· Computer interface: GPIB

· Serial interface: RS–232C

* Select one, instead of standard RS–485

## Communication cable

· RS-485 cable: 5, 10 m

· GPIB: 2, 4 m

· RS-232C: 1.5, 3, 5 m

## Plug socket

To supply power to external equipment

· 2 plug sockets

· Rated capacity 100 VAC 3 A
(Total capacity)

## Power cable

5 m, 10 m

* The chamber does not come with a power cable.

# Thermal Shock Chamber Series

## Air to Air Thermal Shock Chamber TSE

A compact thermal shock chamber to handle thermal shock testing on small and limited volume specimens. It supports standardized testing with no auxiliary cooling and a two-zone (+150°C and −65°C) upstream air temperature recovery time within 5 minutes. The TSE model provides the same performance as ESPEC's large thermal shock chambers in a compact design.

| Model | Temp. range | Inside dimensions (mm) |
|---|---|---|
| TSE–11 | High temp. side: +60 to +200°C<br>Low temp. side: −65 to 0°C | W320 x H148 x D230 |

## Air to Air Thermal Shock Chamber TSD

A two-zone thermal shock chamber that complies with Japanese and global test standards such as MIL-STD-883 and JIS C 0025.
The TSD model can perform accurate testing by monitoring the specimen temperature and starting the exposure time count once it has reached the preset temperature or it can immediately proceed to the next step in the sequence. The temperature recovery time between +150°C and −60°C is just 15 minutes, which reduces the total test duration.

| Model | Temp. range | Inside dimensions (mm) |
|---|---|---|
| TSD–100 | High temp. side: +60 to +200°C<br>Low temp. side: −65 to 0°C | W710 x H345 x D410 |

## Liquid to Liquid Thermal Shock Chamber TSB

The liquid to liquid thermal shock chamber is designed to apply higher stress to specimens.
It has also greatly reduced required minimum installation space. The highly airtight test areas and numerous new mechanisms reduce brine consumption, thus greatly reducing running costs.
It features easy operation thanks to the color LCD interactive touch-screen system.

| Model | Temp. range | Specimen basket dimensions (mm) |
|---|---|---|
| TSB–21 | High temp. chamber: +70 to +200°C<br>Low temp. chamber: −65 to 0°C | W120 x H150 x D120 |
| TSB–51 | | W150 x H150 x D200 |

# Custom-made Equipment

## Thermal Shock Chamber 300°C specification

Chambers that achieve high-temperature exposure of 300°C in thermal shock testing to find heat resistance at high temperatures.

| Model | | TSA-72ES (+300°C specification) | TSD-100 (+300°C specification) | TSE-11 (+300°C specification) |
|---|---|---|---|---|
| Temp. range | High temp. side | +60 to +300°C | | |
| | Low temp. side | –70 to 0°C | –65 to 0°C | |
| Temp. recovery performance | High-temp. exposure/time | +300°C/30 min. | +270°C/40 min. | +300°C/30 min. |
| | Ambient-temp. exposure/time | Ambient temp./5 min. | – | |
| | Low-temp. exposure/time | –65°C/30 min. | –40°C/40 min. | –45°C/30 min. |
| | Sensor position | Upstream of specimen | | |
| | Specimen | Plastic molded ICs: 5 kg | Plastic molded ICs: 5 kg | Plastic molded ICs: 1 kg |
| | Temperature recovery time | Within 20 min. | Within 5 min. | Within 10 min. |
| Test area dimensions (mm) | | W410 x H460 x D370 | W710 x H345 x D410 | W320 x H148 x D230 |

* Supported TSA series models: TSA-72ES, TSA-102ES, TSA-72EH

## Large capacity Thermal Shock Chamber

TSA–1650H　　TSA–2600H

These chambers can be used to test large products such as large parts used in automobiles, large flat panel displays that continue increasing in size, and solar cell modules. These chambers can also test a large volume of specimens at a single time in such fields as quality inspections in manufacturing processes.

- Two types of air direction: vertical and horizontal
- Features Eco operation mode

| Model | | | TSA-1050H | TSA-1650H | TSA-2600H | TSA-3600H |
|---|---|---|---|---|---|---|
| System | | | Two- or three-zone by means of damper switching | | | |
| Performance | Test area | High temp. exposure | +60 to +180°C | | | |
| | | Low temp. exposure | –60 to –10°C | | | |
| | Temp. recovery performance | Recovery conditions | • Two-zone: High-temperature exposure: +150°C, 60 min.<br>Low-temperature exposure: –50°C, 60 min.<br>• Sensor position: Upstream of specimen | | | |
| | | Temp. recovery time | Within 10 min. | | | |
| Test area dimensions (mm) | | | W1500 x H700 x D1000 | W1500 x H1100 x D1000 | W1200 x H1200 x D1800 | W1200 x H1500 x D2000 |
| External dimensions (mm) | | | W2620 x H1785 x D2862 | W2620 x H2210 x D3184 | W4370 x H2290 x D2500 | W4370 x H2590 x D2700 |

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JSA QMS JIS Q 9001 JSAQ 004

MS JAB CM001

MS JAB CM021

ISO 14001 JACO EC99J2046

UKAS ENVIRONMENTAL MANAGEMENT 051

### ISO 9001/JIS Q 9001
**Quality Management System Assessed and Registered**

ESPEC CORP. has been assessed by and registered in the Quality Management System based on the International Standard ISO 9001:2008 (JIS Q 9001:2008) through the Japanese Standards Association (JSA).

* Registration : ESPEC CORP.
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### ISO 14001 (JIS Q 14001)
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